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24. (New) The method for forming a stator for an automotive alternator according to Claim 19 wherein opening portions of said slots in said annular shape are smaller than widths of said straight portions.

25. (New) The method for forming a stator for an automotive alternator according to Claim 19 wherein widths of said teeth alternate in size in a circumferential direction of said annular shape.

26. (New) The method for forming a stator for an automotive alternator according to Claim 19 wherein a size of an interval in a circumferential direction between a center of air gaps of adjacently formed slot opening portions alternates from one interval to the next.

27. (New) The method for forming a stator for an automotive alternator according to Claim 19 wherein projections extending in a circumferential direction are formed on said teeth, said projections each having a length, and an interval in a circumferential direction between a center of air gaps of adjacently formed slot opening portions is alternated by alternating said lengths of said projections.

REMARKS

Claims 1-5 and 9-27 are all the claims pending in the application. Claim 1 is amended for clarity. Claim 9 is an independent claim added to correspond to dependent Claim 7, which is hereby cancelled. Claim 10 is added to replace Claim 8, which is hereby cancelled. Independent Claim 15 is added to correspond to the embodiment of the Applicants' invention previously

claimed in dependant Claim 6, which is hereby cancelled. Dependent Claims 11-14 and 16-18, and method Claims 19-27, are also added by this Amendment, submitted in response to the Office Action mailed January 4, 2001, and believed to be fully responsive to each point of the rejection raised therein. Accordingly, favorable reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Applicants thank the Examiner for acknowledging the claim of priority under 35 U.S.C. § 119. Applicants request that the Examiner acknowledge receipt of the certified copy.

In paragraph 1 of the Office Action, the Examiner objects to the disclosure due to statements made in relation to the 72 slots of the stator core. Applicants believe the Examiner may have misunderstood the meaning of the second paragraph/sentence on page 3. The problem in the prior art overcome by the present invention is not specific to the number of slots, but rather to the mechanical and electrical angles of respective slots and the method of manufacturing and installing the stator coils. Applicants have amended the second paragraph/sentence on page 3 to improve clarity.

Referring to the benefit of the present invention mentioned in the last full paragraph on page 3, the Examiner requests an explanation of how the stator coil installation characteristics of the present invention are better than the prior art. The Examiner states that correction is required. Applicants traverse this particular requirement because the requested explanation is provided in the specification as originally filed.

In each of the embodiments of the present invention, installation of the stator coils during the manufacture of the stator core differs from that of the prior art. In the first full paragraph on page 8 and following, a fundamental difference between various processes of installing the stator coils during the manufacture of a first embodiment of the present invention and the prior art is explained. That is, the coils are installed while the stator core is flat or somewhat curved, following which the stator core is bent into the final annular shape.

This fundamental difference facilitates the mounting of the stator coils on the stator core, that is, the stator coil installation, in a manner that leads to higher quality and lower cost. Furthermore, with regard to the second described embodiment of the present invention, the installation or "connecting operation" is simplified and the joining properties are improved. Page 8, last paragraph.

In paragraph 1 of the Office Action, the Examiner objects to the disclosure due to the use of the acronym "SPCC" that is not spelled out. SPCC represent a symbol, not an acronym, adopted in the Japanese Industrial Standards, and refers to cold-rolled steel plate of a low carbon variety. Applicants have amended the second full paragraph in the detailed description on page 6 of the specification for clarity.

In paragraph 2 of the Office Action, the Examiner states that Figures 8-11 should be designated by a legend such as --Prior Art--. In response, the Applicants submit herewith a Request for Approval of Proposed Drawing Corrections adding the suggested legend to Figures 8-10. However, the Applicants respectfully disagree with the Examiner's assertion that only

prior art is illustrated in Fig. 11. The chart of Fig. 11 depicts a continuum of possibilities, only one of which corresponds to prior art - the rightmost point on the abscissa. Therefore, the Applicants respectfully request that Fig. 11 be approved as filed, without the suggested legend.

In paragraph 3 of the Office Action, the Examiner objects to the drawing “because reference character ‘23’ has been used to designate both ‘stator winding’ and ‘stator coils’.” Applicants point out that both of these terms have the same meaning. However, for the sake of consistency, the specification has been amended to refer to “stator coils” only.

Also in paragraph 3, the Examiner points out that reference character 124a has been used to designate long and thin projections, short projections, and projections generally. In response, the Applicants have amended the specification and submit herewith a Request for Approval of Proposed Drawing Corrections to add reference character 124b, thus better distinguishing the long and thin projections 124a from short projections 124b.

In paragraph 3 of the Office Action, the Examiner also points out that reference character 224 has been used to designate stator core, wide tooth, and adjacent teeth. In response, the Applicants have amended the specification and submit herewith a Request for Approval of Proposed Drawing Corrections to change reference character 224 into two reference characters better distinguishing a thin tooth 224c from a wide tooth 224d. Furthermore, Applicants have corrected two typographical errors in the last paragraph on page 8 inadvertently referring to stator core 222 as stator core 224.

In paragraph 4, the drawings are objected to because they do not include reference numbers 19, 20, 225, and 227, mentioned in the written description. In response, those reference numbers have been added to Figs. 7 and 8 in the Request for Approval of Proposed Drawing Corrections submitted herewith.

The Applicants have further amended the specification to improve the clarity of the written description of the invention. For the foregoing reasons, the Applicants request that all of the objections to the specification and the drawings be withdrawn.

Claims 1-8 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. As detailed hereinafter, Claims 6-8 are hereby cancelled. Therefore, Applicants submit that the rejection under 35 U.S.C. § 112, second paragraph is no longer applicable to those claims.

The Examiner requests that the Applicant explain the meaning of the recitation in Claim 1 that "said stator coils become an inner side thereof and both end surfaces thereof are contacted to connect said stator core in an annular shape." In response, the Applicants amend Claim 1 for clarity, and note that the explanation requested by the Examiner is contained in the specification as filed.

The formation of the stator core is illustrated with respect to a first embodiment for example in Fig. 3. Fig. 3 illustrates that, during the manufacturing process of forming the rounded stator core, end surfaces are brought together and welded. See paragraph bridging pages 6 and 7 and weld 224b in Fig. 7. This forms the annular shape shown. The recitation of an

“inner side” refers to the side of the annular-shaped stator core facing inwardly. The original bar form of the stator core is seen in Fig. 1.

For the foregoing reasons, the Applicants respectfully request that the rejection of Claims 1-5 and under 35 U.S.C. § 112, second paragraph be withdrawn.

With regard to Claim 6, the Examiner requests an explanation of the phrases “on tips said teeth,” “mutual interval,” and “projecting lengths of said projections.” By this response, the Applicants have added independent Claim 15 to claim the embodiment of the Applicants’ invention previously claimed in Claim 6, which is hereby cancelled. To the extent that new Claim 15 includes the language quoted by the Examiner, the Applicants have altered that language for clarity.

→ Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Kusase et al. (U.S. Patent No. 5,122,705) (hereinafter “Kusase”). However, Claim 1 as amended recites “said stator core then being formed into an annular shape such that . . . end surfaces of said stator core are fixed together to complete said annular shape” (emphasis added). Conversely, Kusase teaches a stator core obtained by stamping and laminating from a plate (or sheet) according to the prior art as discussed in the present application in the second sentence of the first full paragraph on page 2. See Col. 4, lines 57-63. Therefore, Applicants request that the rejection of Claim 1 under 35 U.S.C. § 102(b) be withdrawn.

Claims 2-5 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kusase further in view of Hendershot (U.S. Patent No. 4,883,999). Claim 7 is hereby cancelled.

Therefore, Applicants submit that the rejection of Claim 7 under 35 U.S.C. § 103(a) is no longer applicable. However, Claim 9 is drawn to incorporate all of the limitations of Claim 7 in a new independent claim. Therefore, Applicants assert that the rejection is inappropriate for the following reason, in addition to the reason previously stated with respect to Kusase.

The primary object of the invention is to suppress or reduce vibration ascribable to the claw-shaped magnetic pole structure of a rotor. Conversely, Hendershot has no concern whatsoever for the claw-shaped magnetic pole structure of a rotor or the negative operational effects thereof. Thus, Applicant asserts that there is no motivation for combining the teachings of Hendershot with the teachings of Kusase. Furthermore, the Examiner has not set forth in the Office Action any motivation for combining the teachings of Hendershot with Kusase, as required.

The Examiner concedes that neither Kusase nor Hendershot teach or suggest contact surfaces formed by dividing a wide tooth in a circumferential direction. Applicants assert that, in a corresponding manner, neither Kusase nor Hendershot teach or suggest alternating widths of the teeth as was claimed in Claim 7, now incorporated into new Claim 9.

As previously stated, Claim 1, from which Claims 2-5 depend, recites “said stator core then being formed into an annular shape such that . . . end surfaces of said stator core are fixed together to complete said annular shape” (as amended with emphasis added). Conversely, Kusase teaches a stator core obtained by stamping and laminating from a plate (or sheet) according to the prior art as discussed in the present application in the second sentence of the

first full paragraph on page 2. See Col. 4, lines 57-63. Similarly, Hendershot neither teaches nor suggests the stator core according to the combination claimed in Claim 1. Therefore, Claims 2-5 should be allowable based at least on their dependence from Claim 1.

Furthermore, the angles α_1 , α_2 disclosed by Hendershot are mechanical angles, not electrical angles as claimed in Claims 3-5. There is no teaching or suggestion in Hendershot of the claimed electrical angles. Applicants assert that there is no teaching or suggestion of the claimed combination, including the claimed electrical angles, in Kusase, Hendershot or the prior art.

It is well settled that “it is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to a full appreciation of what such reference fairly suggests to one skilled in the art.” See Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, 796 F.2d 443, 448, 230 USPQ. 416, 419 (Fed. Cir. 1986) (citing In re Wesslau, 353 F.2d 238, 241, 147 USPQ 391, 193 (CCPA 1965), cert. denied, 484 U.S. 823 (1987)). Applicants assert that only by the impermissible use of hindsight knowledge of Applicant’s own disclosure would the Examiner have acquired a motivation to combine the teachings of the cited references according the precise combination including certain elements and excluding certain others as necessary to achieve the claimed invention.

For the foregoing reasons, Applicants request that the rejection of Claims 2-5 under 35 U.S.C. § 103(a) over Kusase in view of Hendershot be withdrawn.

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Claims 6 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kusase in view of Hendershot and Burgbacher et al. (U.S. Patent No. 5,331,245) (hereinafter "Burgbacher"). By this Amendment, Claims 6 and 8 are both cancelled. However, by this amendment, new Claim 15 is added to claim the embodiment of the Applicants' invention previously claimed in Claim 6. And new Claim 10, depending from new Claim 9 corresponds directly to Claim 8.

As previously stated, the primary object of the invention is to suppress or reduce vibration ascribable to the claw-shaped magnetic pole structure of a rotor. Conversely, Hendershot and Burgbacher have no concern whatsoever for the claw-shaped magnetic pole structure of a rotor or the negative operational effects thereof. Thus, Applicant asserts that there is no motivation for combining the teachings of either Hendershot or Burgbacher, must less both, with the teachings of Kusase. Furthermore, the Examiner has not set forth in the Office Action any motivation for combining the teachings of Hendershot and Burgbacher with Kusase, as required.

New Claim 9 recites "said stator core then being formed into an annular shape such that . . . end surfaces of said stator core are fixed together to complete said annular shape" (as amended with emphasis added). As previously discussed with respect to Claims 1-5, neither Kusase or Hendershot teach or suggest the stator core according to this claimed combination. Similarly, Hendershot does not teach or suggest the stator core according to this claimed combination.

Therefore, Applicants assert that new Claim 9 is patentable over the cited prior art. And, new Claim 10-14 should be allowed based at least on their dependence from new Claim 9.

Further, the Examiner concedes that Kusase, standing alone, does not teach or suggest all of the limitations of Claim 6. The Examiner also concedes that neither Kusase nor Hendershot teach or suggest projections extending in a circumferential direction that have varying lengths as now claimed in Claim 15. The Examiner relies on Burgbacher to overcome this deficiency.

However, Burgbacher neither teaches nor suggests alternating “an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions” as claimed in new Claims 11 and 15, from which new Claims 12-14 and 16-18 depend. For the foregoing reasons, the Applicants assert that new Claims 9-18 are patentable over the cited prior art.

As previously argued, it is well settled that an Examiner may not, within the framework of section 103, pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to a full appreciation of what such reference fairly suggests to one skilled in the art. *See Bausch & Lomb*, 796 F.2d at 448, 230 USPQ at 419. Applicants assert that only by the impermissible use of hindsight knowledge of Applicant’s own disclosure would the Examiner have acquired a motivation to combine the teachings of Hendershot, Burgbacher, and Kusase according the precise combination including certain elements and excluding certain others as necessary to achieve the claimed invention.

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In view of the foregoing, the claims are now believed to be in form for allowance, and such action is hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The specification is changed as follows:

Page 2, third full paragraph:

In the automotive alternator constructed in this manner, electric current is supplied from a battery (not shown) through the brushes 10 and the slip ring 9 to the rotor coil 15, generating magnetic flux. The claw-shaped magnetic poles [19] of the first pole core 17 are magnetized as north (N) poles by this magnetic flux, and those [(poles 20)] of the second pole core 18 are magnetized as south (S) poles thereby. Meanwhile, rotational torque from the engine is transmitted through the belt and the pulley 4 to the shaft 5, rotating the rotor 6. Thus, a rotating magnetic field is applied to the stator [winding] coils 23, generating electromotive force therein. This alternating electromotive force passes through the rectifiers 12 and is converted into direct current, the magnitude of the current is adjusted by the regulator 14, and the battery is recharged.

Page 2, fourth full paragraph:

In the above automotive alternator, there [are one (1) slots 25] is one slot 25 for each (1) set of the stator coils 23, each (1) phase and each (1) magnetic pole. Magnetic field leakage is seldom formed between adjacent claw-shaped magnetic poles 19, 20 of the rotor 6 via teeth 24 and the time over which magnetic flux leaks to the teeth 24 is short. Accordingly, there is [a]

only a small decrease in the effective magnetic field for the stator coils 23 occurring due to magnetic flux leakage, and surges in the magnetic flux [is] are reduced.

Page 3, second full paragraph:

In a conventional automotive alternator constructed as above, [since the stator core has 72 slots, which is a lot] there is a problem in that the insertion time and installation characteristics of the stator coils 23 in the stator core 22 are poor.

Page 3, third full paragraph:

[Also, with the conventional automotive alternator, as shown in] FIG. 11 [which] is an electromagnetic field analysis chart drafted by the present inventors. For the conventional automotive alternator, [(Slot] slot opening portions (the abscissa) are spaced a uniform interval of 30 degrees of electrical angle[, this means that, for]. In another example, with a mechanical angle of 24 degrees, electrical angles of 24 degrees and 36 degrees [are repeated] alternate and the interval is uneven. The ordinate shows ratios of higher harmonic components of magnetomotive force in the stator with respect to a fundamental wave[)]. When [when] the interval of the slot opening portions is [an] equal to 30 degrees, fifth (5th) and seventh (7th) harmonics are not present in the magnetic flux density waveform. Nevertheless, eleventh (11th) and thirteenth (13th) higher harmonic components of magnetomotive force in the stator 8 are large, and when 11th or 13th higher harmonic components of magnetomotive force are present in the rotor 6 there are problems that, surges in magnetic flux cannot be sufficiently suppressed due to interference by the harmonic components and fluctuation in the generated voltage cannot be

sufficiently suppressed. Moreover, magnetic attractive force is generated between the claw-shaped magnetic poles 19, 20 of the rotor 6 and the stator 8 and causes the stator 8, case 3 and the like or the claw-shaped magnetic poles 19, 20 of the rotor 6 to resonate which generates a sound that is unpleasant for passengers.

Page 6, second full paragraph under the centered heading:

As shown in Fig. 1, a stator core 122 according to the present invention is formed in a rectangular shape by laminating a predetermined number of sheets of a cold-rolled steel plate (SPCC) material, one of the low carbon steel plates, which are sheet-shaped magnetic members punched in a predetermined shape. A total number of seventy-two (72) teeth 124, which is the same as in the related art, are formed at one side of a yoke 123. Trapezoid-shaped slots 125 are formed between adjacent teeth 124.

Page 7, first full paragraph:

FIG. 5 is a partial enlarged view of a stator core according to the present invention. In the present invention, although the total number of slots 125 is the same as that in a conventional example, 72 slots, and there are 12 rotor magnetic poles, an interval, taken from the center of air gaps of adjacent slot opening portions 127, in a circumferential direction, is uneven. That is, projections 124a, 124b extending in a circumferential direction are formed on the tips of the teeth 124 which partition the slots 125, and a mutual interval in the circumferential direction between the center of air gaps of adjacent slot opening portions 127 is varied by long and thin projections 124a and short projections [124a] 124b.

Page 8, first full paragraph:

Also, the stator core 122 having a plurality of small thin teeth 124 in a plurality of slots is not (formed as) a conventional one-piece tubular object but is shaped from a laminated rectangular body [rectangular] into a cylindrical shape via a manufacturing process. Hence, mounting of the stator coils on the stator core is facilitated and the quality of the product may be improved while at the same time lowering the cost.

Page 8, first full paragraph under the heading "Embodiment 2":

FIG. 7 is an enlarged view of an essential portion of a stator core showing another example of the stator for [a] an automotive alternator according to the present invention. In a stator core 222 according to the present invention, adjacent teeth [224] 224c, 224d are formed with, alternating uneven widths. Slots 225 are substantially equal in width. Slot opening portions 227 between wide teeth 224d and thin teeth 224c are comparable to air gaps of adjacent slot opening portions 127. As with slots 225, slot opening portions 227 between wide teeth 224d and thin teeth 224c have approximately the same widths, and an interval in the circumferential direction between the center of [air gaps of] adjacent slot opening portions 227 is an uneven, repeated interval of 24 degrees and 36 degrees.

Page 8, second full paragraph under the heading "Embodiment 2":

Accordingly, projections 224a extending in a circumferential direction formed in slot opening portions 227 may be formed in the same shape. Consequently, similar effects may be

obtained without forming the long and thin projections 124a and short projections 124b provided in Embodiment 1.

Page 8, last full paragraph:

Furthermore, in the present embodiment, a wide tooth [224] 224d is divided in a circumferential direction by substantially orthogonal surfaces 224b. These surfaces 224b serve as contact surfaces when [connecting a] forming the stator core [224 as] 222 into an annular shape. The stator core [224] 222 of [an] annular shape is produced by welding these surfaces 224b. Hence, a stator core 222 may be obtained in which the function of the contact surfaces 224b is facilitated, the connecting operation is simplified, and joining properties [are] thereof are high.

IN THE CLAIMS:

Claims 6-8 are canceled.

The claims are amended as follows:

1. (Amended) A stator for an automotive alternator [characterized in that, in an automotive alternator comprising:], said stator comprising[.];

a stator core in which a plurality of slots extending in axial directions are formed at an inner circumference thereof and two sets of three-phase stator coils which are fitted into said slots, wherein [; and a rotor provided inside the stator so as to be capable of rotating, comprising a rotor coil for flowing a current to generate magnetic flux, and a pole core for housing the rotor

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coil and forming a plurality of claw-shaped magnetic poles in accordance with magnetic flux,
and,]

2 slots are provided for each phase of said stator coils and each magnetic pole and the
total number of the slots is 72 or more, and

said stator core is formed as a lamination of [such that] a plurality of sheet-shaped
magnetic members with a plurality of teeth [patterning] defining said slots at one side of a yoke
[are laminated], said stator coils [are] being disposed in said slots, and said stator core [is
rounded] then being formed into an annular shape such that said stator coils become disposed at
an inner side at said inner circumference thereof, and [both] end surfaces [thereof] of said stator
core are [contacted to connect said stator core in an] fixed together to complete said annular
shape.

Claims 9-27 are added as new claims.